

3. In both groups of cases dysentery is prone to occur in the non-ptotic type of person in whom a hypermotility of the stomach is present. Contrariwise, constipation is apt to be found in the ptotic individual in whom the mechanical factors leading to constipation exist.

4. The symptoms and response to treatment in both groups of cases differ noticeably according to the presence or absence of the general asthenic state.

5. Both groups of cases are distinctly amenable to treatment, and good end-results can be obtained under suitable conditions.

DIGITALIS AND THE CONTROL OF AURICULAR FIBRILLATION AND AURICULAR FLUTTER, WITH ELECTROCARDIO- GRAMS ILLUSTRATING THE EFFECT.

BY ROBERT H. HALSEY, A.B., M.A., M.D.,
NEW YORK.

(From the Medical Department of the New York Post-Graduate Medical School
and Hospital.)

THE intention of these remarks is to offer for discussion and in that way emphasize a method of using digitalis in some forms of cardiac decompensation and arrhythmia.

No review of the physiological action and preparations of digitalis will be attempted, but it is necessary to state the preparation, the size of the doses, and the method of administration that the indications which guided in their use may be understood. To illustrate the type of case and the desirable and expected action of digitalis, 4 cases will be briefly related and the electrocardiograms showing various effects exhibited.

In the choice of preparations, preference has been given in the order related to the tincture, the infusion, digipuratum, and, for emergencies, crystalline strophanthin (Thoms), or methyl-gouabain, which Hatcher believes to have the same action. The tincture was given in 15 to 30 minims, not drop doses, every four hours, as a maximum dose. The infusion in $\frac{1}{2}$ -ounce doses was used when edema was extreme. If objection was made by the patient to the fluid preparations, digipuratum was given in minimum doses of four tablets in the twenty-four hours. If none of these preparations could be used, or immediate action was desired, crystalline strophanthin (Thoms), 0.0005 gram, diluted in 2 to 4 c.c. of freshly distilled water, or salt solution (this is the equivalent of 1 to 4000 to 1 to 8000), and injected slowly into a vein, or half this dose may be given twice a day. Strophanthin in such a dose

should not be given if the patient has had any of the digitalis bodies during the previous week, nor should it be repeated within twenty-four hours. These precautions must be observed, since digitalis and strophanthin are synergists, and in the circumstances stated the total effect of absorbed digitalis and of the rapidly absorbed strophanthin might very well be quickly and fatally toxic. The amorphous preparations of strophanthin are only about half the strength of the crystalline, and unreliable.

Nausea and vomiting may be produced by digitalis, and they are also distressing complications of heart failure. If these symptoms have resulted from the digitalis, it has required three or four days of dosage with the drug; but if they belong to the heart failure, it follows immediately from any distasteful potion. The element of time of onset of the nausea and vomiting is important in the differential. When nausea or vomiting is present, precluding the use of the drug by mouth, and the digitalis effect is desired, strophanthin may be used intravenously, or an enema may be given, consisting of 120 c.c. of milk containing either 2 c.c. of the tincture or 30 c.c. of the infusion of digitalis. If the digitalis produces nausea before it slows the heart it will avail nothing to change the preparation, in the belief that by so doing the nausea will cease, for the nausea is the result of the digitalis acting on the vomiting center in the medulla. Eggleston and Hatcher¹ believe they have shown conclusively by animal experiment that both vomiting and diarrhea are of central origin. Nausea occurs most frequently before slowing of the heart in patients with marked arteriosclerosis.

In arteriosclerotics with fibrillation of the auricle and Cheyne-Stokes type of periodic breathing, digitalis may prolong the period of apnea and exaggerate the dyspnea portion of the cycle. Small doses, 5 minims of the tincture of belladonna, may give prompt relief and should be continued until digitalis effect is relieved.

Working with isolated coronary arteries, C. Voegtlin and D. I. Macht² believe they have shown that digitonin causes a relaxation of the arterial wall, while digitoxin and digitalin cause constriction. The great efficacy of the infusion is due probably to the digitonin promoting the circulation and nutrition of the heart muscle. The persistence of the action of digitalis will vary, depending upon the amount absorbed and fixed in the tissues, which amount depends upon the elimination being less than the absorption.³

Some cases after full doses of digitalis may require ten to fourteen days before all evidence of the digitalis effect disappears. There need be no fear of cumulative effect of digitalis when given by the mouth in doses to control fibrillation.

¹ Jour. Pharm. and Exper. Therap., 1912, iv, 113, and Jour. Am. Med. Assn., 1913, ix, 499.

² Jour. Pharm. and Exper. Therap., 1913, v, 1.

³ Hatcher, R. A.: Arch. Int. Med., 1912, x. Eggleston, C.: Jour. Am. Med. Assn., 1912, lix, 1352.

The first case demonstrates how promptly strophanthin intravenously can reduce the ventricular rate in fibrillation of the auricle, and how that rate subsequently can be controlled by digitalis.

CASE I.—M. Q., aged thirty-two years, married, admitted complaining of palpitation, shortness of breath, vomiting, and swollen legs. Her family history is irrelevant. As a child she had measles, chicken-pox, typhoid, and at fifteen her first attack of rheumatism. She had three children and no miscarriages, and seven months before admission her last child was born. Six months before admission she had pneumonia, since which time she has been short of breath on exertion. Five days before admission her feet swelled, the amount of urine diminished, and her heart began to palpitate. On examination she was cyanotic, orthopneic, gasping for breath, with paroxysms of coughing and at times vomiting; her legs were greatly swollen and her back up to the dorsal region was edematous; the pulsating liver was enlarged to the level of the umbilicus and the lungs had coarse and fine rales up to the level of the angles of the scapula. The apex of the heart was felt in the sixth space 13 cm. to the left of the midline, and the action was grossly irregular and tumultuous, with ventricle contracting at the rate of 135 to 150 per minute (Fig. 1); the count at the wrist was only 80 per minute, a deficit of 50 to 70 per minute. Ten hours after admission an intravenous injection of crystalline strophanthin, 0.5 mg. was given. Half an hour later she was breathing quietly and could lie on three pillows with comfort. Digipuratum, four tablets per day for five days, were given until the ventricular rate decreased to 85 per minute. Four days later, as the rate of the ventricle increased, she was given $\frac{1}{2}$ ounce of the infusion twice a day. While taking this amount of the infusion the edema diminished, the urine increased in quantity, and the heart frequency was controlled. She regained her strength and left the hospital. To control (Fig. 2) the heart rate, however, it has required the continued use of a maximum daily dose of three-quarters of an ounce of the infusion of digitalis. With this dose she is able to be about the house doing light tasks, but diminishing or discontinuance of the dose means immediate distress and disability. The need of continuing for the remainder of life such a dose of digitalis as will control the heart rate must be emphasized, for in cases with fibrillating auricles this point is very often neglected, and after a short interval without digitalis these cases return in great distress. The neglect to prescribe or use digitalis in this manner occurs not only in hospital and dispensary but also in private practice, and the withholding seems to be due to ignorance of the necessity for the continued action of the digitalis. Each case must be tried out to discover the amount of the particular preparation of digitalis which will be required to control the heart action. Not only does

the strength of the preparations of the tincture or infusion made by different firms vary, but it must always be borne in mind that each individual reacts in a different degree to the same preparation,

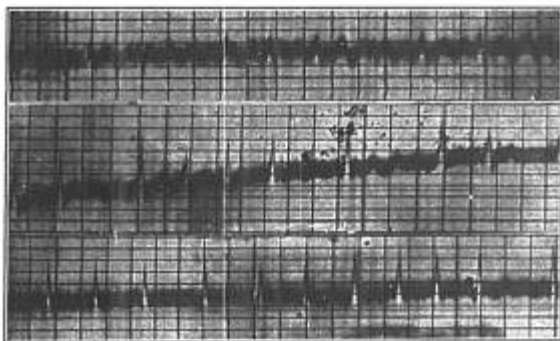


FIG. 1.—Case I. M. Q., taken June 16, 1914, before strophanthin was given, shows auricular fibrillation, with a ventricular rate of 140 to 150 and a positive or upward directed *T*-wave in lead II.

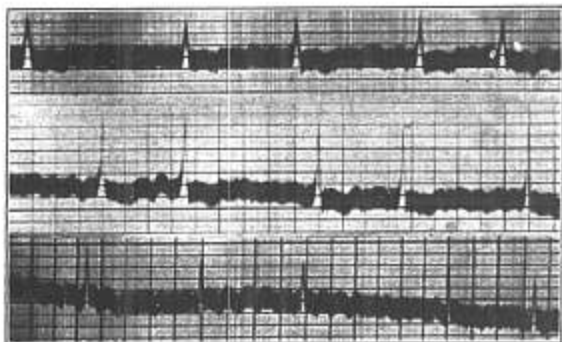


FIG. 2.—Case I. M. Q., taken November 19, 1914, shows the slower rate of the ventricle to be 80 to 90, though the auricle continues to fibrillate. The slower rate is maintained by digitalis, the second effect of which is shown by the negative or downward-directed *T*-waves of lead II.

and therefore it follows that the two variables of patients and preparations must be tried out.

The regulation of the ventricular rate is brought about by the action of digitalis on the mechanism conducting the impulses to contract over the auriculoventricular muscle bridge or bundle of

His. Two demonstrated facts show that a great part, if not all, of its inhibiting effect is due to stimulation of the vagus nerve endings in the auriculoventricular bundle: (1) pressure⁴ on the vagus in the neck can slow the rate of the ventricle, and (2) atropin can release the ventricle from the digitalis effect and permit the ventricular frequency to increase. When the heart muscle is only moderately damaged the increase from atropin may be as much as two or three times the slow rate, while in arteriosclerosis of marked degree the atropin may produce little or no effect unless huge (0.1 grain) doses are used. Digitalis produces or increases the functional heart block. From experimental work on the lower animals⁵ there is evidence to point toward disturbances of the functions of contractility and conduction of the heart muscle as the cause of fibrillation, by which term is understood that condition of the auricular muscle in which the separate muscle fibers contract individually and not with coördination; the auricle remains in diastole while its walls quiver with the fibrillating muscle fibers. The numerous and rapid contractions of the auricular muscle send rapidly recurring impulses to the auriculoventricular bundle, by which they are transmitted to the ventricle, and digitalis reduces the rate at which these impulses are conducted and delivered to the ventricle; but judging from the electrocardiograms it has little or no effect on the fibrillation rate of the auricular muscle. On the rate of normally rhythmic heart, little or no effect is produced by therapeutic doses of digitalis; but in the condition of fibrillating auricle, digitalis usually produces a very prompt and profound effect. So certain and dependable is this reaction of the inhibitory mechanism of the heart to digitalis that its absence in cases of fibrillation should be interpreted as insufficient dose, inactive preparation, or extensive muscle damage. It is one method of physiologically testing the sample of digitalis.

The second case is one of fibrillation, which under a brief treatment by digitalis returned to normal sequential rhythm.

CASE II.—R. M., aged fourteen years, had measles and many attacks of tonsillitis. For two years she had heart trouble, but came to hospital for an attack of only seven weeks' duration following "catching cold." Examination showed a girl with marked orthopnea, cyanosis, and vomiting at intervals; heart very much enlarged, with the apex in the left axilla sixth space, and consolidation of the left lower lobe; a pericardial friction rub could be heard over the precordium, and in the back the interesting phenomenon was noted that the friction sound could be heard through the consolidated lung; the liver was palpable 4 cm. below the free border of the ribs. The fibrillation of the auricle was revealed by

⁴ Robinson, G. C., and Draper, G. J.: *Exper. Med.*, 1911, xiv, 217.

⁵ Mines, G. R.: *Jour. Physiol.*, 1914, xlv, 349. Levy, A. G.: *Jour. Physiol.*, 1914, xlix, 54.

the gross irregularity of the heart rhythm and (Fig. 3) taken March 29, 1915. She was given a small amount of morphin to make her comfortable, as she was suffering considerable pain from the pericarditis, and next day strophanthin, $\frac{1}{75}$ grain twice a day

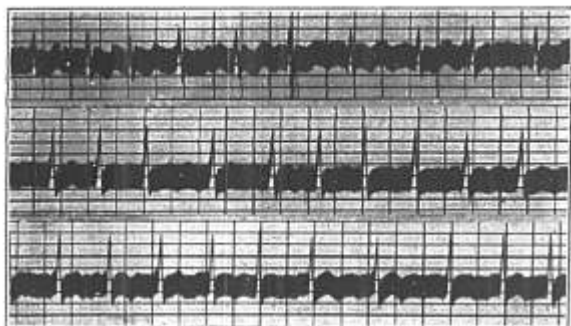


FIG. 3.—Case II. R. M., taken March 29, 1915, before digitalis effect obtained, shows the auricle fibrillating with a ventricular frequency of 157 to 170 and the *T*-waves of lead II upward or positive in direction.

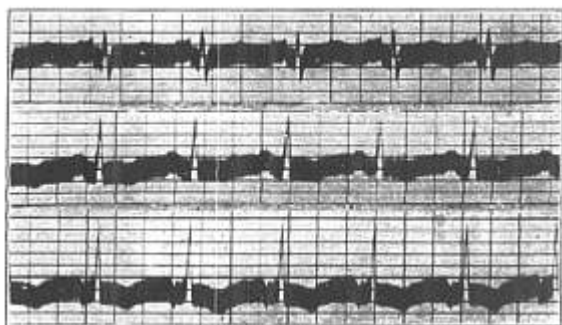


FIG. 4.—Case II. R. M., taken April 2, 1915, after digitalis was given, shows the auricle and ventricle contracting in normal or sequential rhythm at the rate of 100 and the *T*-wave of lead II is frankly negative or downward.

hypodermically. On the fourth day, because of nausea, she was given tincture of digitalis, 30 minims in milk (120 c.c.) as a rectal enema and repeated every four hours. After eight doses the ventricular rate slowed to 100 per minute and the rhythm suddenly became regular and sequential, as shown by Fig. 4, and the digi-

talis was discontinued. By sequential rhythm is understood the coördinate contraction of the auricles, followed after a definite period by the contraction of the ventricle. Once the auricle has begun to fibrillate it most commonly continues to fibrillate for the remainder of life. Rarely one may see attacks of paroxysmal tachycardia which prove to be either fibrillation or flutter and the normal rhythm be undisturbed after the attacks.

The third case is one of auricular flutter, which was altered to fibrillation by strophanthin and controlled by digitalis.

CASE III.—L. M., aged forty-two years, married, referred to me by Dr. L. Kast. As business manager of a successful London theater he was for many years under great responsibility, and it was while traveling for professional purposes in this country that he came under observation. He had always used alcohol more or less frequently in excessive amounts, and he began to smoke tobacco at fourteen. In other respects he enjoyed excellent health and denies having had venereal disease. When sixteen years of age he had his first attack of acceleration and palpitation of the heart, accompanied by shortness of breath. The first attack and others were ushered in and terminated by a sudden "thump" of the heart. The attacks frequently followed the eating of a large meal, and then would be relieved by vomiting. When the attacks occurred at other times he thought they were terminated by such procedures as holding his breath, belching, a drink of brandy, or formalyltol, very hot poultices applied to the chest, or in several instances by the jarring of a taxicab over a rough pavement. Frequently the attacks would cease during sleep. One week before he was first seen, and compelling him to terminate a hard business trip, the attack of which we have the records, began with palpitation so vigorous as to shake him visibly; the least exertion brought on great distress in breathing, and there was pain and tenderness to pressure in the epigastrium and right hypochondrium. Examination showed a man, moderately cyanotic, sitting in bed breathing quietly but frequently; the body shaken by the vigor of the heart beat. There was very slight dulness and numerous fine rales over the bases of both lungs behind. The liver was tender to pressure and the edge could be felt at a point 5 or 6 cm. below the free border of the ribs. There was no edema of the legs or ankles. The ventricular frequency was about 175 per minute and regular; the electrocardiogram (Fig. 5), showed auricular flutter, with two to one heart block. Four days later, because increasing dyspnea, pulmonary edema, cyanosis, epigastric pain, and edema of the ankles indicated an increasing heart failure, an intravenous injection of $\frac{1}{8}$ grain of crystalline strophanthin was given. Within an hour following this dose the mechanism of the heart changed to fibrillation, record No. 386 (Fig. 6), with the ventricular rate of 115 to 130. Six days later, and before digitalis by mouth became effec-

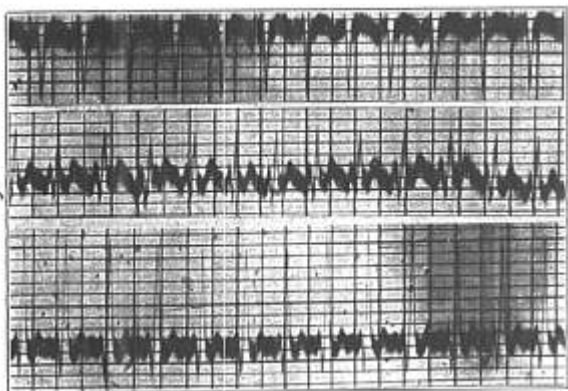


FIG. 5.—Case III. L. M., taken April 10, 1914, before digitalis was given, shows the rapid contracting auricle and ventricle of "flutter" at 175 per minute.

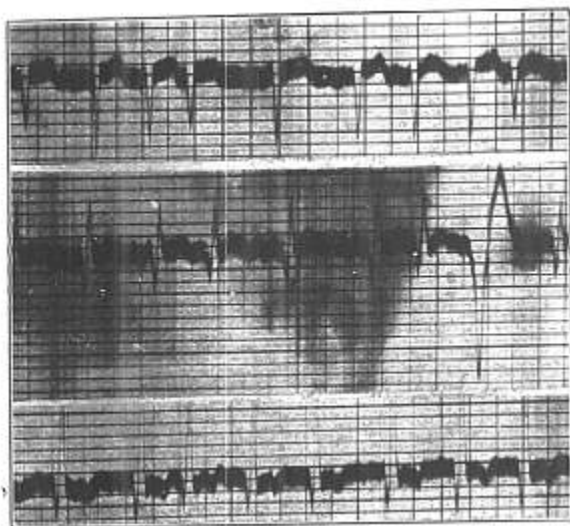


FIG. 6.—Case III. L. M., taken April 14, 1914, after strophanthin had been given and auricular fibrillation produced with a rate of approximately 115. The T-wave lead II in upward negative.

tive, the ventricular rate increased to 155 to 172, though the fibrillation persisted (Fig. 7). Under digipuratum the heart rate gradually

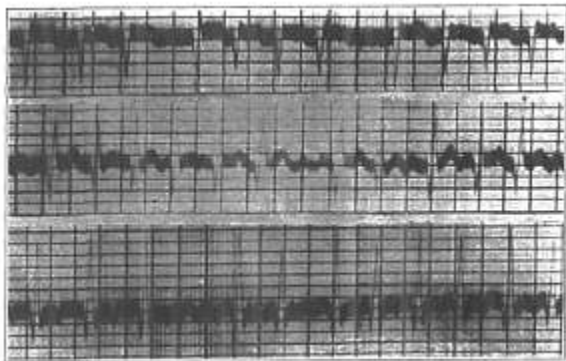


FIG. 7.—Case III. L. M., taken April 17, 1914, before the digitalis given by mouth had become effective, the ventricular rate increased to 155 to 172 per minute, but the auricular fibrillation persisted.

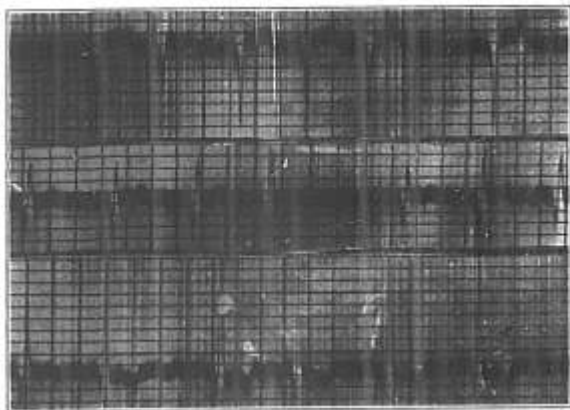


FIG. 8.—Case III. L. M., taken April 24, 1915, after the digitalis became effective, shows the ventricular rate to be about 85 per minute, with fibrillation present.

came down to 85, where it was maintained, though the fibrillation remained (Fig. 8).

CASE IV.—O. C., aged sixty-five years, was seen for the first time nine days after the removal of his prostate by Dr. J. Bentley Squier. Four days previously his heart had become very rapid and digalen in 10-minim doses, three times a day, had failed to produce any effect on the rate or rhythm. He was short of breath, restless, and conscious of the rapidly and energetically beating heart. He had the pallor peculiar to the arteriosclerotic, chronic nephritic prostatic. The blood examination showed 5,136,000 red cells; 6800 leukocytes; 55 per cent. hemoglobin. The phthalein test showed an output of 60 c.c. of urine in two hours, containing 49 per cent. of the drug.

There was an indeterminate history of rheumatism at thirty-five years of age, but otherwise his history was negative. Before operation the pulse was 88, and subsequently it was 96 to 100 until the high rate noticed on the fifth day.

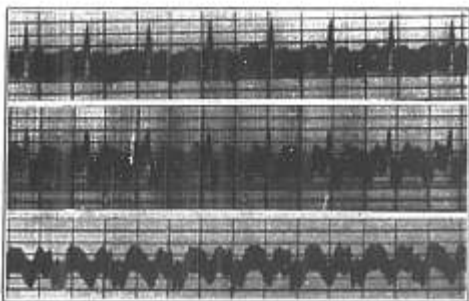


FIG. 9.—Case IV. O. C., taken February 18, 1916, shows auricular flutter at 320 per minute, two to one heart block and ventricle at 160 per minute.

The apex was in the fifth space 10 cm. to the left of the midline. The ventricular rate was about 160 per minute while the count of the radial was 120, thus showing the deficit of 40 beats. The lungs were clear and the liver edge was palpable and tender to pressure.

The electrocardiogram showed the auricle to be in flutter at the rate of 320 per minute, while because of a partial block of 2 to 1 the ventricular rate was 160 per minute (Fig. 9).

The tincture of digitalis in 30-minim doses every four hours was given, and two days later the auricles were in fibrillation, with a ventricular rate of 104 (Fig. 10). The digitalis was continued, and two days later the ventricular rate was 76 (Fig. 11). Because of the sense of nausea being rather severe he refused to continue the digitalis for four days, when the increasing commotion of the fibrillating ventricle caused him to be persuaded to try the tablet

of digipuratum, two tablets every four hours. The rate of the ventricle came down, and four days later the auricle became regular at 72 per minute, with the ventricular contraction following every beat at a time interval of 0.2 second (Fig. 12).

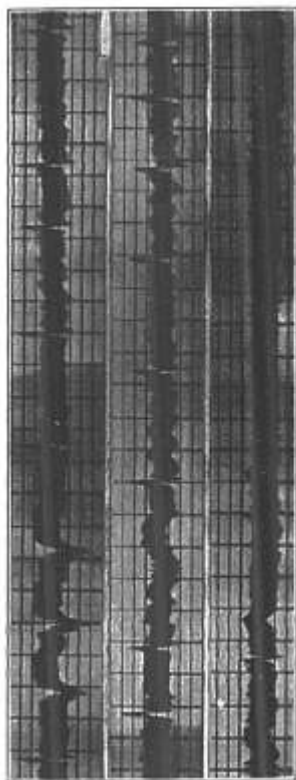


FIG. 10.—Case IV. O. C., taken February 10, 1916, shows fibrillation of auricle with ventricular rate of 104.

Many cases of flutter have been reported which have been changed to fibrillation, and subsequently, after slowing by digitalis, have resumed their normal sequential rhythm. This is the aim and hope of the procedure.

The employment of digitalis to effect the rhythm as shown in these cases should not permit us to forget that such use depends

on the accurate diagnosis of the condition. If there is doubt as to the cause of pulse frequency one should hesitate in the administration of such doses of digitalis, for the production of fibrillation

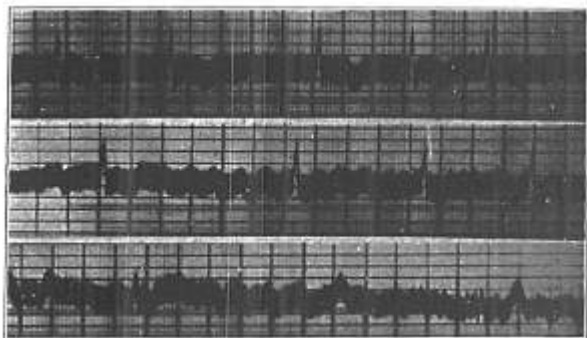


FIG. 11.—Case IV. O. C., taken February 21, 1916, shows fibrillation with ventricular rate of 90.

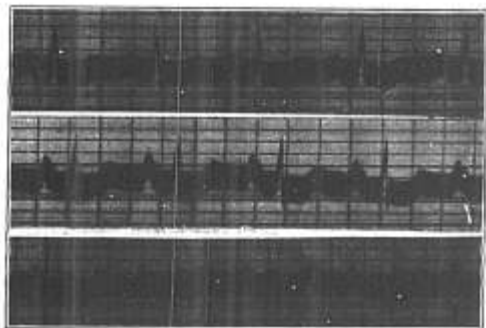


FIG. 12.—Case IV. O. C., taken February 29, 1916, shows sequential rhythm, with conduction time of 0.2 sec. *T*-wave in lead II downward. *S*-wave of lead III taken in conjunction with *R*-waves of leads I and II, showing hypertrophy of left ventricle.

in an otherwise healthy heart would not be desirable nor justifiable. With proper precautions we may draw the following conclusions:

1. The gross irregularity of the ventricle in cases with fibrillation of the auricle can be controlled by digitalis if sufficient drug is exhibited.

2. The patient should be instructed to continue the use of digitalis for the remainder of life, and should be taught how to determine the amount of the dose necessary from day to day to control the heart rate. Give sufficient drug to maintain the rate of the ventricle below 70 per minute when counted after a rest in the late afternoon.

3. The fibrillating auricle under a short course of digitalis may return to normal rhythm.

4. In auricular flutter the aim of treatment with digitalis is to produce auricular fibrillation and then control the rate of the ventricle with digitalis, hoping in the favorable cases for a renewal of normal sequential rhythm.

SYPHILIS OF THE LUNG.*

By H. LISSER, A.B., M.D.,

INSTRUCTOR IN MEDICINE, SAN FRANCISCO.

(From the Department of Medicine, University of California Medical School.)

CLAYTOR,¹ in 1905, made the following statement: "Whether we agree with the majority who hold that syphilis of the lung is rare in the adult, or with the few who consider it more common, we all must accept the opinion of the best authorities that the condition does exist. Now when it is taken into consideration that syphilis is curable and that the advanced cases of pulmonary tuberculosis, with which it is likely to be confounded, are as a rule, incurable, one should be all the more careful to make no mistakes." This in brief is the chief reason for reviewing the subject; not so much for the purpose of presenting a few cases that have perhaps some academic interest, but chiefly in the hope that by constantly bearing in mind that syphilis of the lung does occasionally occur, we may by correct diagnosis and intensive treatment save a life that might otherwise be lost. As Virchow² said: "Some patients die of so-called tuberculosis for lack of antisyphilitic treatment."

The question of its frequency or rather rarity is of some interest, in that considerable divergence of opinion has existed from time to time. This disagreement has not depended entirely upon the personal judgment of the individual author, but has reflected rather closely the development of clinical medicine.

HISTORICAL. A survey of the abundant literature can be conveniently divided into three historical epochs:

1. A long period, beginning with Paracelsus in 1500 and ending with Laennec in 1800.

* Read before the San Francisco County Medical Society and before the University of California Hospital Medical Society.